Improving Fiscal Policy to Maximize Benefits of Unconventional Oil Development in Montana Communities

by Mark Haggerty & Julia Haggerty

Introduction

Drilling for oil and natural gas is a high impact economic activity. Today's unconventional oil development and its effects differ in important ways from oil booms of the past. As the Bakken oil boom continues in North Dakota, Montana communities from Sidney to Billings are already feeling impacts and must consider their preparedness for the acceleration of drilling boom across the state line.

State and local fiscal policy—how the resource is taxed and how the revenue is distributed and spent—has a profound effect on the capacity for state and local governments to manage the impacts of energy development. By ensuring revenue is available in the time, place, and amount necessary to mitigate industrial and population growth related impacts, and by investing and saving revenue for long-term economic development, tax policies can increase the benefits of energy development.

One lesson from the recent natural gas surge (2003–2008) is that there is significant room for improvement in energy taxation in Montana and across the Rocky Mountain West. Ideally, states sharing unconventional oil resources would standardize fiscal policies, applying a consistent set of best practices to benefit communities and also industry by providing more predictability and certainty.

The current reality in the Bakken is that Montana and North Dakota take different approaches to taxing oil and gas activity, and to spending, sharing, and saving energy revenues. The differences affect the scope and nature of the economic development opportunities and challenges for Bakken communities on either side of the state line. This paper provides an overview of the unconventional oil resource in the Bakken to highlight the unique challenges and opportunities associated with this kind of energy development. We then compare state energy fiscal policies in Montana and North Dakota, and lastly offer a list of recommended changes to fiscal policy in Montana.

The Unconventional Bakken Oil Resource

Located mainly under portions of Montana, North Dakota, and Saskatchewan, the Bakken shale formation covers more than 200,000 square miles. Estimates of technically recoverable oil vary from 3 billion barrels to 24 billion barrels.[1]

Freeing the oil trapped in the Bakken shale depends on horizontal drilling and fracking technology. In the Bakken, these technologies were first applied in Montana's Elm Coulee field in the early 2000s. Fracking and horizontal drilling techniques quickly moved into North Dakota, where development is now centered. North Dakota's oil production increased from 2.5 million barrels per month in 2004 to more than 19.8 million barrels per month by May 2012, more than a seven-fold increase.[2]

Short-lived Burst of Production in Bakken Wells Means More Widespread, Repeated Drilling Activity

Drilling and fracking an unconventional shale oil well generates an initial rush of oil that subsequently declines quickly.[3] Unlike previous periods of oil development in the West—which were marked by an initial disruptive drilling phase followed by a long, relatively quiet production phase—development in the Bakken will be characterized by a continuous cycle of activity.

1 U.S. Department of the Interior, U. S. Geological Survey. Press Release. 3 to 4.3 Billion Barrels of Technically Recoverable Oil Assessed in North Dakota and Montana's Bakken Formation—25 Times More Than 1995 Estimate." April 10, 2008. http://www.usgs.gov/newsroom/article.asp?ID=1911. Fox, Michelle. Aug 24, 2011. CEO: 24 Billion Barrels of Oil in Bakken Shale. CNBC. http://www.cnbc.com/id/44255518.

2 U.S. Energy Information Agency. Field Production of Crude Oil (Thousand Barrels) by Area. http://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_m.htm.

3 The decline is not linear, however, and most wells will eventually stabilize and continue to produce for 30 years or more, albeit at volumes much lower than those achieved in the first year of production.

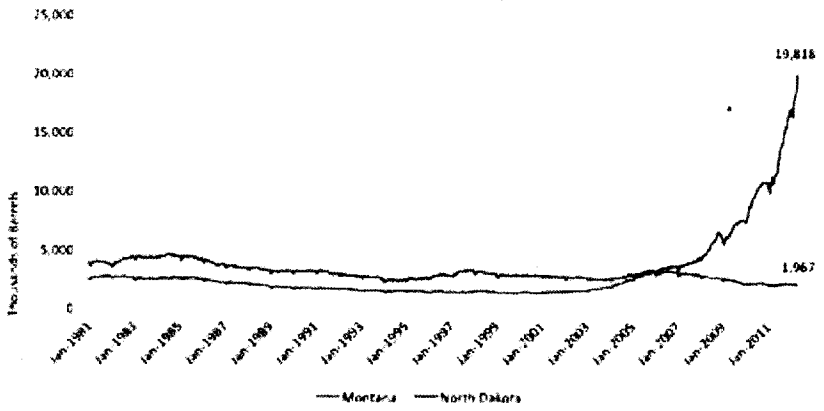
The basis for this change in the pattern of activity can be easily grasped by comparing the productivity of Alaska's Prudhoe Bay to the Bakken. A single Prudhoe Bay oil well could yield 10 million barrels of oil; in the Bakken a single well might yield half a million barrels of oil on average.[4] In addition to drilling more wells to access equivalent amounts of oil, companies have also been exploring the use of intensive secondary production technologies such as refracking.

An average horizontal Bakken oil well drilled between 2008 and 2011 produced at an average rate of 372 barrels per day in the second month, declining to a low of 78 barrels per day in the 36th month. Based on these data, the typical Bakken well in the second year will produce only 55 percent of what it produced in the first year, a 45 percent decline. The decline rate slows to 32 percent in the third year. After three years, average daily production of 78 barrels is only 21 percent of the peak average daily production of 372 barrels achieved in the second month of production.[5] These steep decline curves explain why companies are invested in developing effective secondary production techniques to keep the oil flowing from Bakken wells.

Together, these trends explain why the cost of production in the Bakken is so high, making oil development dependent on today's high world oil prices. Should prices fall (a recent Baker Hughes estimate suggests that $80 per barrel is the price point at which the average well becomes unprofitable[6]), production would drop steeply. The implications for communities tied to unconventional oil fields are profound. In the conventional oil boom, oil production—even after all drilling activity had been abandoned—offered an ongoing revenue stream (albeit one tied to volatile energy prices). In the unconventional development model, production levels will decline quickly, meaning that revenue would drop off steeply as well, reflecting both price and actual volume effects. In this sense, the risk of revenue volatility is even higher in unconventional production than with conventional oil production.

For North Dakota's and Montana's communities in the Bakken, the continuous drilling and fracking, and intensive secondary production activities will deepen social and industrial impacts and extend them over a long period of time. The arrival of jobs, revenue, and impacts in successive waves of development that may become the characteristic of unconventional oil development in the Bakken presents obvious economic opportunities, as well as challenges.

Figure 1. Monthly Oil Production in Montana and North Dakota, Jan. 1981 - May 2012.



U.S. Energy Information Agency. Field Production of Crude Oil (Thousand Barrels) by Area. http://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_m.htm.

Unconventional Resources and Economic Development Challenges

Four main challenges inherent to unconventional oil confront communities attempting to benefit from the extraction of non-renewable resources. To overcome boomtown stresses, and to get ahead in the long term, fiscal policy must address each of these in turn[7]:

4 BP Prudhoe Bay Fact Sheet, August 2006. Alaska's Prudhoe Bay had produced nearly 11 billion barrels of oil from just 1,114 wells by 2006, nearly 10 million barrels per well. http://www.bp.com/liveassets/bp_internet/us/bp_us_english/STAGING/local_assets/downloads/a/A03_prudhoe_bay_fact_sheet.pdf. Continental Resources estimates that 48,000 wells will need to be drilled over several decades to extract up to 24 billion barrels of oil from the Bakken (half a million barrels per well).

5 Data on production trends provided by geoLOGIC Data Center (http://www.geologic.com/solutions/data/index.htm), calculations provided by VISAGE consultants, (http://www.visageinfo.com/).

6 "U.S. oil below $80 could slow shale oil drilling boom: Baker Hughes." Reuters News Service. Jul 20, 2012. http://www.reuters.com/article/2012/07/20/us-oil-bakerhughes-idUSBRE86J1A520120720

7 The short format of this article precludes a detailed literature review. The 1980s energy bust in the West produced an important cohort of sociological studies documenting boom and bust stresses in rural communities, and opportunities for recovery. Key references include: Brown, R. et. al. 2005. The Boom-Bust-Recovery Cycle: Dynamics of Community Satisfaction and Social Integration in Delta, Utah. Rural Sociology 70(1):28-49, Gulliford, A. 2003 (1989). Boomtown Blues: Colorado Oil Shale. Boulder: Univ. of Colorado Boulder Press. Smith, M. D., et. al. 2001. Growth, Decline, Stability, and Disruption: A Longitudinal Analysis of Social Well-Being in Four Western Rural Communities. Rural Sociology 66(3): 425-450. Another body of work seeks trends in the economic performance and well-being of areas specialized in extractive industries. See: James, A., and D. Aadland. "The Curse of Natural Resources: An Empirical Investigation of US Counties." Resource and Energy Economics 33, no. 2 (2011): 440–453. Relatively little attention has been paid in the academic literature to the link between institutions, like tax regimes, and economic performance in the United States, although the link between institutions and economic performance at the national level is a subject of strong interest in scholars of the "resource curse," c.f., Freudenburg, William R. 1992. "Addictive Economies: Extractive Industries and Vulnerable Localities in a Changing World Economy." Rural Sociology 57 (3) (September 1): 305–332. Mehlum, H., K. Moene, and R. Torvik. "Institutions and the Resource Curse*." The Economic Journal 116, no. 508 (2006): 1–20.

In addition, a number of white papers produced during the natural gas boom have considered the fiscal situation facing

1. **Amount:** The cost of managing energy impacts often outstrips tax revenues. Studies and regional examples show that governments could remove incentives or raise tax rates without harming overall production.
2. **Timing:** The time-lag between initial energy impacts when wells are drilled and when revenue is received from production can extend up to two years.
3. **Distribution:** Some energy revenues should go to all areas impacted by energy development.
4. **Volatility:** Price fluctuations can quickly accelerate or end quickly, making it difficult for communities to meet financial commitments or conduct multi-year projects.

The energy producing states in the West, including North Dakota and Montana, differ in how they levy taxes against drilling activities and production, and how the revenues are distributed and spent.[8] Each state does relatively well addressing one or more of the four basic challenges, but no state has what could be considered a full suite of "best practices" that accomplish the goal of making energy development sustainable for energy-focused areas. The following discussion highlights differences between North Dakota and Montana.

Fiscal Policy in Montana and North Dakota: Amount and Timing

To highlight the impacts of differences in Montana and North Dakota's fiscal policies as they relate to new unconventional oil drilling and production, consider the revenue collected from a typical horizontally-drilled oil well in North Dakota's Bakken. There are two striking points of difference:

- Montana will collect $800,000 less from each new well compared to North Dakota.
- It takes nearly two years after a well is completed before Montana collects any significant revenue from the oil it produces.

Figures 2 and 3 compare the types of taxes levied, the effective tax rate, and the timing of tax collections between Montana and North Dakota based on a typical horizontally completed Bakken oil well.[9] Figure 4 compares the states in terms of cumulative revenue and average tax rate on the first three years of production of an average well.

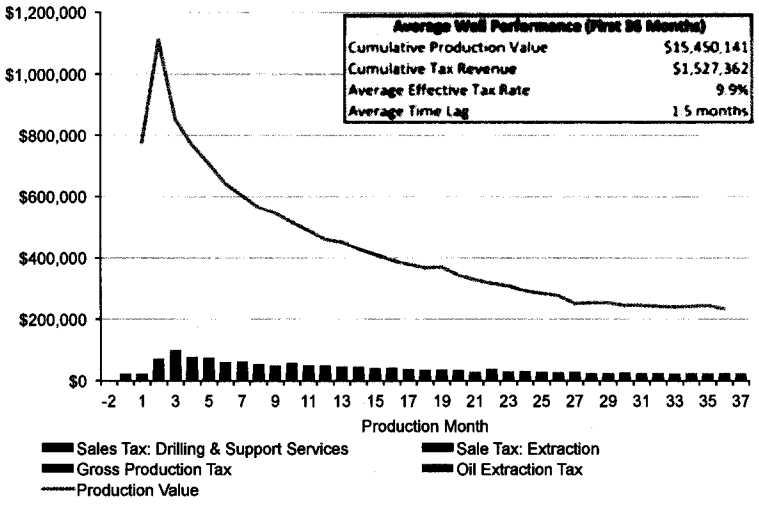


Figure 2. Tax Revenue Generated from an Average Bakken Horizontal Oil Well in North Dakota[11]

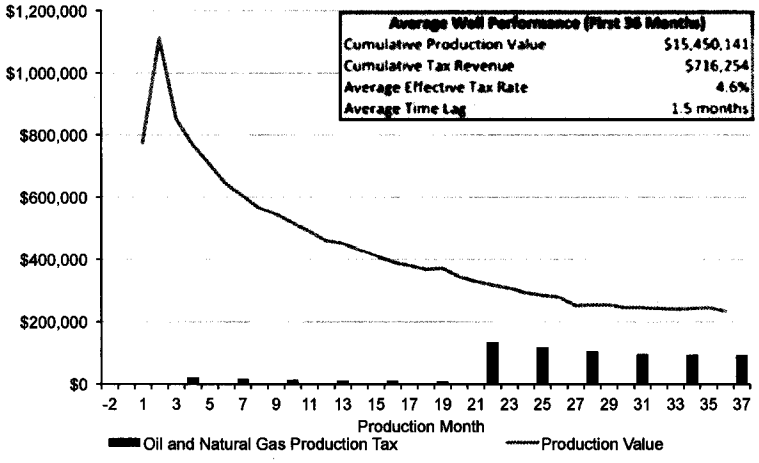
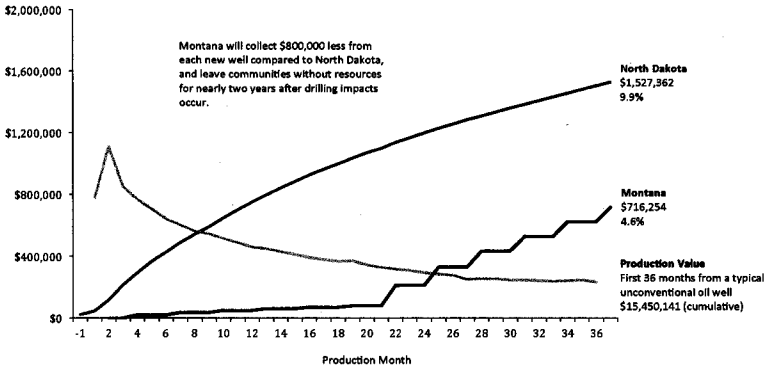


Figure 3. Tax Revenue Generated from an Average Bakken Horizontal Oil Well in Montana[12]



Source: geoLOGIC Data Center (http://www.geologic.com/solutions/data/index.htm). Calculation and visualization from VISAGE (http://www.visageinfo.com/).

Figure 4. Cumulative Revenue and Average Tax Rate on the First Three Years of Production from an Average Bakken Oil Well

local governments in places such as Colorado and Wyoming. Two relevant studies are: BBC Research & Consulting, 2008. Northwest Colorado Socioeconomic Analysis and Forecasts, Report prepared for the Associated Governments of Northwest Colorado and Ecosystem Research Group, 2009. Sublette County Socioeconomic Impact Study, Phase II—Final Report. Report prepared for Sublette County Commissioners.

8 Headwaters Economics, 2012. "Benefiting from Unconventional Oil." **http://headwaterseconomics.org/energy/western/unconventional-oil-and-north-dakota-communities/**

9 The total production value and the timing of production value for a typical Bakken oil well is estimated by applying a constant price to the production curve of the typical well. At $98/bbl the average Bakken horizontal oil well will produce $15.45 million in cumulative production value over the first three years of its life, peaking at $1.1 million in the second month and declining to $233,142 in the 36th month of production.

Figure 2 illustrates that North Dakota captures revenue relatively early in the drilling and initial production phase. In North Dakota, a sales tax collects revenue from drilling and support services and two production taxes levied monthly ensure a short lag between production and revenue collections. North Dakota's average effective tax rate is higher over the first 36 months of production at 9.9 percent ($1.5 million in cumulative tax revenue) compared to Montana's average effective tax rate of 4.6 percent ($716,254 in cumulative tax revenue) over the same period (Figure 3). It also takes nearly two years after a well is completed before Montana collects any significant revenue from the oil it produces.

Montana performs so poorly because the state has no sales tax on drilling and support services, and grants an 18-month holiday on production from new horizontal wells.[10] The cumulative revenue curves in Figure 4 shows how Montana (red curve) will collect $800,000 less from each new well over the first 36 months of production compared to North Dakota (blue curve), and leave communities without resources for nearly two years after drilling impacts occur.

Fiscal Policy in Montana and North Dakota: Distribution

Even with its comparative advantage in capturing more revenue more quickly from unconventional oil wells, North Dakota's local governments are experiencing difficulties in keeping pace with service and infrastructure needs. This is an outcome of the state's approach to distribution energy revenue.

North Dakota guarantees a relatively small amount of direct distribution of total oil revenue to local governments in the form of legislated local tax collections, direct distributions, or dedicated energy impact grants. In North Dakota in FY 2011, only 7.9 percent of oil tax revenue was distributed directly to local governments. Changes made in the 2011 legislative session will increase the state's mandated direct contributions to 11.2 percent of total projected revenue. By comparison, communities in Montana receive about 39 percent of all state production tax revenue. These shares fall short of distributions in Colorado (63%) and Wyoming (69%).[11]

To compensate for the state's low direct distribution threshold, the Governor's office and state legislature will direct $1.2 billion to energy-impacted counties in 2012 and 2013, about 59 percent of total projected oil revenue of $2 billion over the same period. Most of these dollars, $850 million, will be in the form of one-time transportation, water, and housing grants and tax incentives. While these one-time transfers are significant, communities do not receive the certainty from a biennial appropriations process that they would from a system of direct distributions based on clear impact metrics and a tax policy that recognizes the unique needs of oil-impacted communities. If drilling continues for 15 to 25 years, community impact funding will be exposed to the political uncertainty imposed by ten or more biennial legislative sessions as local communities rely on the state legislature and the Governor's office for grants and revenue distributions.

Unevenness in where revenue is distributed and where impacts occur can be one of the main reasons that mitigation efforts fall short. Both Montana and North Dakota make distributions largely on the location of actual oilfield development activity (typically to county governments). This policy works to the disadvantage of larger population centers to which workers and their families gravitate, bringing with them rapid increases in service demands, housing shortages, and other social impacts. Some areas can compensate with local option sales taxes, but this places the burden of oil-related costs onto the entire population and is politically uncertain as local levies and taxes are often voted down.[12]

Fiscal Policy in Montana and North Dakota: Volatility

Energy taxes and royalties are based on production value, which can be highly volatile. As a result, energy revenue can be highly volatile, too. Providing services from an uncertain revenue stream makes long-term fiscal planning difficult, and can be risky particularly for rural counties and small towns. Tax structure has an important dampening or exaggerating effect on revenue volatility, so states have the ability to bring greater predictability to their revenue stream.

Tax rates and incentives tied to production volume or price will exaggerate volatility (e.g., North Dakota's incentive tax rate is tied to a price trigger). State grant funds and permanent investment funds can build a long-term and a more stable revenue stream and provide flexibility to make up revenue gaps for communities. North Dakota has initiated a permanent fund that will start making distributions in 2017. Montana has no permanent savings and relatively small impacts grants program. In the short term, neither state has significant policies or savings to dampen revenue volatility.

Discussion: Improving Fiscal Policy across the Bakken

North Dakota's monthly assessed production taxes do a good job of collecting revenue in a timely manner, and the price trigger means the "tax holiday" incentive rate is not in effect at today's high prices. The state's sales tax

10 State of Montana Office of Budget and Program Planning. Fiscal Year 2013 Biennium Budget, Section 4. Natural Resource Taxes Revenue Estimates. http://budget.mt.gov/content/execbudgets/2013_Budget/2013B_Docs/Section_04.pdf. (accessed 5/18/2012).

11 Headwaters Economics, 2012. "Benefiting from Unconventional Oil." http://headwaterseconomics.org/energy/western/unconventional-oil-and-north-dakota-communities/

12 This is a key strategy for municipalities in Wyoming. See Headwaters Economics. 2011. "Fossil Fuel Extraction and Western Economies." http://headwaterseconomics.org/wphw/wp-content/uploads/Fossilfuel_West_Report.pdf.

allow local governments to realize revenue from drilling activities and support services as wells are being drilled and fracked. Montana could emulate these policies to reduce the time lag by eliminating the tax holiday and by allowing resource production communities to levy a local-option sales tax, similar to the resort tax or bed tax. Each state could facilitate energy impact planning to anticipate needs, support local impact fees, and use a portion of the state's share for energy impact grants that can help direct money to new boomtowns across the states as industry activity shifts.

Montana distributes significantly more of the state production tax directly back to communities. North Dakota could increase its direct distribution formula to provide more certainty and resources to boomtowns. Direct distributions in both states should consider a dual formula based partially on the location of production, and partially on workforce location to reduce disparities between impact and revenue availability. Colorado's Energy/Mineral Impact Assistance grant program[13] serves as a useful template for such a direct distribution policy. A state impacts grants program can again help resolve jurisdictional unevenness.

Finally, both states could remove incentives or increase the base tax rate to avoid leaving money on the table. Recall that as a result of the tax holiday, Montana will collect $800,000 less per well over the first three years of production with no indication that this incentive is effective at increasing drilling or production in the state. (In February 2012, 185 drilling rigs were working in North Dakota, compared to 18 in Montana.[14]) North Dakota actually has a tax holiday similar to Montana's, except that it includes a "price trigger" that removes the incentive when oil prices rise above a threshold price (currently around $60 per barrel).[15] After the price trigger was surpassed in November 2009 and the incentive was no longer available to industry, production in North Dakota more than doubled by February 2012 (monthly production rose from 7.4 to 16.2 million barrels[16]) while Montana's production,

which retains a tax holiday, dropped by 14 percent over the same period (monthly production declined from 2.1 to 1.8 million barrels[17]).

One of the purposes of a severance tax is to ensure that communities and the state benefit from the depletion of non-renewable resources. The typical mechanism for replacing this wealth is through direct investments in infrastructure, education, economic development, and long-term savings that ensure lasting fiscal benefits.

Higher effective tax rates will allow communities to achieve these goals. Montana is the only state in the West that does not have any sort of permanent investment fund for oil or natural gas revenue. Montana could eliminate or raise the current limit on the Resource Indemnity Trust, a key funding mechanism designed to act as an insurance policy against damages like groundwater contamination. Alternatively, Montana could establish a new permanent fund, similar to the coal tax trust fund, to provide long-term benefit to the state. North Dakota established a permanent fund in September 2011, which has already grown a principle balance of $446 million by July 2012.

In summary, Montana and North Dakota each have places where fiscal policy could be improved, and the states could learn from each other and their peers across the West. Ideally, the two legislatures would coordinate to ensure that each state overlying the Bakken could adopt similar policies that would benefit industry, and ensure counties experiencing impacts could all benefit.

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13 See: http://www.colorado.gov/cs/Satellite/DOLA-Main/CBON/1251594715231. Accessed 8/14/2012.

14 Baker Hughes, North American Rotary Rig Count by State, February 2012 Average. http://investor.shareholder.com/bhi/rig_counts/rc_index.cfm.

15 North Dakota adapted a similar incentive rate for wells drilled between June 2008 and July 2009 to encourage horizontal drilling for oil in the Bakken formation that lowered the base tax rate from 11.5 percent to 7 percent. The tax incentive was subsequently extended permanently during the 2009 legislative session, including a price trigger that makes the incentive effective only when the price of crude oil drops below a threshold price. State of North Dakota, Office of State Tax Commissioner. 2007. Oil Extraction Tax Incentive. http://www.nd.gov/tax/oilgas/pubs/bakkennewwells.pdf. State of North Dakota, Office of State Tax Commissioner. Oil Extraction Tax incentive Becomes Ineffective November 1, 2009. https://www.nd.gov/tax/oilgas/pubs/horizontalnewwellmemo.pdf.

16 U.S. Energy Information Administration. North Dakota Field Production of Crude Oil (Thousand Barrels). http://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_m.htm (accessed 5/17/2012).

17 U.S. Energy Information Administration. Montana Field Production of Crude Oil (Thousand Barrels). http://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_m.htm (accessed 5/17/2012).